REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1 through 25 are presented for consideration. Claims 1, 11, 13, 19, 21, 22, 24 and 25 are independent. Claims 16 and 17 have been canceled without prejudice or disclaimer. Claims 1-4, 7-13, 19, 21, 22, 24 and 25 have been amended to clarify features of the subject invention. Support for these changes and claims can be found in the original application, as filed. Therefore, no new matter has been added.

The specification has been amended to place the subject application in better form.

In the drawings, it is proposed that Fig. 12 be amended to correct an inadvertent error in the reference numeral "11a" in the lower left portion of the figure and that Fig. 13 be amended to add a reference numeral "23a". The proposed changes are shown indicated in red in the enclosed drawing sheets. Approval of the changes is respectfully requested.

Claims 11 and 13 objected to as being dependent upon a rejected base claim have been indicated as allowable if written in independent form including all of the limitations of the base claim and any intervening claims. Claim 11 has been amended to include all of the limitations of original claim 1 and Claim 13 has been amended to include all of the limitations of original Claims 1, 2 and 12. Accordingly, Claims 11 and 13 as currently amended are believed to be allowable.

Claims 1-6, 12 and 14-21 have been rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 4,200,774 (Newberry et al.) Claims 7-10 have been rejected under 35 U.S.C. §

103(a) as unpatentable over Newberry et al. in view of U.S. Patent 5,834,783 (Muraki et al.). With regard to the claims as currently amended, these rejections are respectfully traversed.

Independent Claim 1 as currently amended is directed to an electron optical system array of plural electron lenses. In the array, plural electrodes are arranged along paths of plural charged-particle beams. Each of the plural electrodes has a membrane in which plural apertures are formed on the paths of the plural charged particle beams and a support portion which supports the membrane at the membrane periphery. The plural electrodes include a first electrode and a second electrode. The support portion of the second electrode is arranged outside the support portion of the first electrode.

Independent Claim 19 as currently amended is directed to a method of manufacturing an electron optical array of plural electron lenses. According to the method, plural electrodes are each having a membrane in which plural apertures are formed to pass charged particle beams and a support portion which supports the membrane at the membrane periphery. A base member is prepared and the support portions of the plural electrodes are fixed to the base member so that the support portion of one of the plural electrodes is arranged outside the support portion of the other one of the plural electrodes.

Independent Claim 21 as currently amended is directed to charged particle beam exposure apparatus in which a charged particle beam source emits a charged particle beam and an electron optical system array having plural electron lenses forms plural intermediate images of the charged particle beam source by the plural electron lenses. A projection electron optical system projects the plural intermediate images formed by the electron optical system array on a

substrate. The electron optical system array has plural electrodes arranged along paths of plural charged particle beams concerning the plural intermediate images. Each of the plural electrodes has a membrane in which plural apertures are formed on the paths of the plural charged particle beams and a support portion which supports the membrane at the membrane periphery. The plural electrodes includes a first electrode and a second electrode. The support portion of the second electrode is arranged outside the support portion of the first electrode.

In Applicants' view, Newberry et al. discloses a combined fine focusing micro lens array and micro deflector assembly for use in electron beam tubes of the fly's eye type. In the assembly, a fine focusing micro lens array sub-assembly is formed from plural spaced-apart stacked parallel thin planar apertured silicon semiconductor lens plates. Each plate has an array of micro lens aperture openings. The lens plates each have highly conductive surfaces and are secured to glass rods to hold the plates in stacked parallel spaced-apart relationship with the apertures axially aligned in parallel. A micro deflector assembly is adjacent to the micro lens array sub-assembly. A micro deflector element axially aligned with each respective fine focusing lens element deflects an electron beam passing through along orthogonal x-y directional axes of movement normal to the electron beam path. The deflector elements have two orthogonally arrayed sets of parallel spaced-apart deflector bars with alternate bars of each set of deflector bars being interconnected electrically for common connection to a respective source of fine x-y deflection potential. The thin planar apertured silicon lens plates having the micro lens array are held together in stacked parallel assembled relationship by spaced-apart glass support rods whose longitudinal axes extend at right angles to the plates and to which the planar silicon lens plates

are secured at their periphery. The two orthogonally arrayed sets of parallel spaced-apart deflection bars forming the sets of micro-deflector elements likewise preferably comprise parallel plates or bars of polycrystalline silicon having a highly conductive metalized surface. The micro deflector bars are held in assembled spaced-apart parallel relationship by respective sets of spaced-apart parallel supporting glass rods whose longitudinal axes extend in a plane parallel to the plane of the deflector bars but at right angles thereto and to which the ends of the deflector bars are thermally bonded. The fine focusing micro lens array and micro deflector sub-assembly are secured together in assembled relation by additional glass support rods being disposed about the outer peripheries of the micro lens and micro deflector sub-assemblies and being secured thereto by thermal bonding such as by fusion.

According to the invention define in Claims 1, 19 and 21, the membrane of each of plural electrodes is supported by an electrode support portion at the membrane periphery with the support portion of the second electrode arranged outside the support portion of the first electrode. The support arrangement of a second electrode support portion outside the first electrode support portion is shown at least in Fig. 1 and is disclosed at least from line 25 of page 14 to line 3 of page 15 in the specification.

Newberry et al. may teach a micro lens array having stacked silicon lens plates 16, 17 and 18 with glass support rods 19 (Fig. 3) or 14A/14B (Fig. 24) for lens support. In Newberry et al., as clearly shown in Fig. 24, lens plates 16, 17 and 18 are stacked vertically with their ends at the same horizontal position in the support 14. As a result, the support member that supports one of lens plates 16, 17 and 18 is not arranged outside the support member of another of lens plates 16,

17 or 18. In contrast to the common support of the ends of lens plates 16, 17 and 18 of Newberry et al., it is a feature of Claims 1, 19 and 21 that the support portion supporting the membrane of a second of plural electrodes is arranged outside the support portion supporting the membrane of a first of the plural electrodes. It is therefore not seen that the common support position required by Newberry et al. as shown in Figs. 3 and 24 could possibly teach or suggest the arrangement of the support portion of one electrode being outside the support portion of another electrode as in Claims 1, 19 and 21. Accordingly, it is believed that Claims 1, 19 and 21 are completely distinguished from Newberry et al. and are allowable.

Claims 22-25 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Newberry et al. in view of U.S. Patent 5,834,783 (Muraki et al.).

Independent Claim 22 as currently amended is directed to a device manufacturing method in which plural semiconductor manufacturing apparatuses including a charged particle beam exposure apparatus are installed and a semiconductor device is manufactured using the plural semiconductor manufacturing apparatuses. In the charged particle beam exposure apparatus, a charged particle source emits a charged particle beam. An electron optical system array having plural electron lenses forms plural intermediate images of the charged particle beam by the plural electron lenses. A projection optical system projects the plural intermediate images formed by the electron optical system array on a substrate. The electron optical system array includes plural electrodes arranged along paths of plural charged particle beams concerning the plural intermediate images. Each of the plural electrodes has a membrane in which plural aperture are formed on the paths of the plural charged particle beams and a support portion which supports

the membrane at the membrane periphery. The plural electrodes include a first electrode and a second electrode. The support portion of the second electrode is arranged outside the support portion of the first electrode.

Independent Claim 24 as currently amended is directed to a semiconductor manufacturing factory in which plural semiconductor manufacturing apparatuses include a charged particle beam exposure apparatus. A local area network connects the plural semiconductor manufacturing apparatuses and a gateway connects the local area network to an external network of the semiconductor manufacturing factory. In the charged particle beam exposure apparatus, a charged particle source emits a charged particle beam. An electron optical system array having plural electron lenses forms plural intermediate images of the charged particle beam by the plural electron lenses. A projection optical system projects the plural intermediate images formed by the electron optical system array on a substrate. The electron optical system array includes plural electrodes arranged along paths of plural charged particle beams concerning the plural intermediate images. Each of the plural electrodes has a membrane in which plural aperture are formed on the paths of the plural charged particle beams and a support portion which supports the membrane at the membrane periphery. The plural electrodes include a first electrode and a second electrode. The support portion of the second electrode is arranged outside the support portion of the first electrode.

Independent Claim 25 as currently amended is directed to a maintenance method for a charged particle beam exposure apparatus in which a database is prepared to store information about maintenance of the charged particle beam exposure apparatus on an external network of a

factory where the charged particle beam exposure apparatus is installed. The charged particle beam exposure apparatus is connected to a local area network in the factory and the charged particle beam exposure apparatus is maintained on the basis of the information stored in the database using the external network and the local area network. In the charged particle beam exposure apparatus, a charged particle source emits a charged particle beam. An electron optical system array having plural electron lenses forms plural intermediate images of the charged particle beam by the plural electron lenses. A projection optical system projects the plural intermediate images formed by the electron optical system array on a substrate. The electron optical system array includes plural electrodes arranged along paths of plural charged particle beams concerning the plural intermediate images. Each of the plural electrodes has a membrane in which plural aperture are formed on the paths of the plural charged particle beams and a support portion which supports the membrane at the membrane periphery. The plural electrodes include a first electrode and a second electrode. The support portion of the second electrode is arranged outside the support portion of the first electrode.

In Applicants' opinion, Muraki et al. discloses an electron beam exposure apparatus which minimizes the influence of the space charge effect and aberrations of a reduction electron optical system, and simultaneously, increases the exposure area which can be exposed at once, thereby increasing throughput. The electron beam exposure apparatus has a source for emitting an electron beam and a reduction electron optical system for reducing and projecting, on a target exposure surface, an image of the source. The apparatus includes a correction electron optical system arranged between the source and the reduction electron optical system to form a plurality

of intermediate images of the source along a direction perpendicular to the optical axis of the reduction electron optical system. The correction electron optical system corrects in advance aberrations generated when the intermediate images are reduced and projected on the target exposure surface by the reduction electron optical system.

It is a feature of Claims 22, 24 and 25 as currently amended that each of plural electrodes has a membrane with plural apertures and a support portion which supports the membrane at the membrane periphery and another feature that the support portion of a second electrode of the plural electrodes is arranged outside the support portion of a first electrode. As discussed with respect to Claims 1, 19 and 21, Newberry et al. only teaches an arrangement of electrodes 16, 17 and 18 that are stacked with their ends aligned along a common support member (14, 19). Muraki et al., as clearly shown in at least Fig. 6B, only teaches electrodes stacked with ends supported by a common support at the same horizontal position. As a result, it is not seen that the addition of Muraki et al.'s electrode stack with ends at the same horizontal position added to Newberry et al.'s arrangement having lens plates stacked so that their ends are at the same horizontal position in a common support could possibly suggest the feature of plural electrodes each having a membrane of plural apertures and a support portion that supports the membrane at its periphery combined with the feature of the support portion of a second electrode being outside the support portion of a first electrode as in Claims 22, 24 and 25. It is therefore believed that Claims 22, 24 and 25 as currently amended are completely distinguished from any combination of Newberry et al. and Muraki et al. and are allowable.

For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 1, 19, 21, 22, 24 and 25 is patentably defined over the cited art, whether that art is taken individually or in combination.

The dependent claims also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicants further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

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Respectfully submitted,

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